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The Weekly Summary of Current Science

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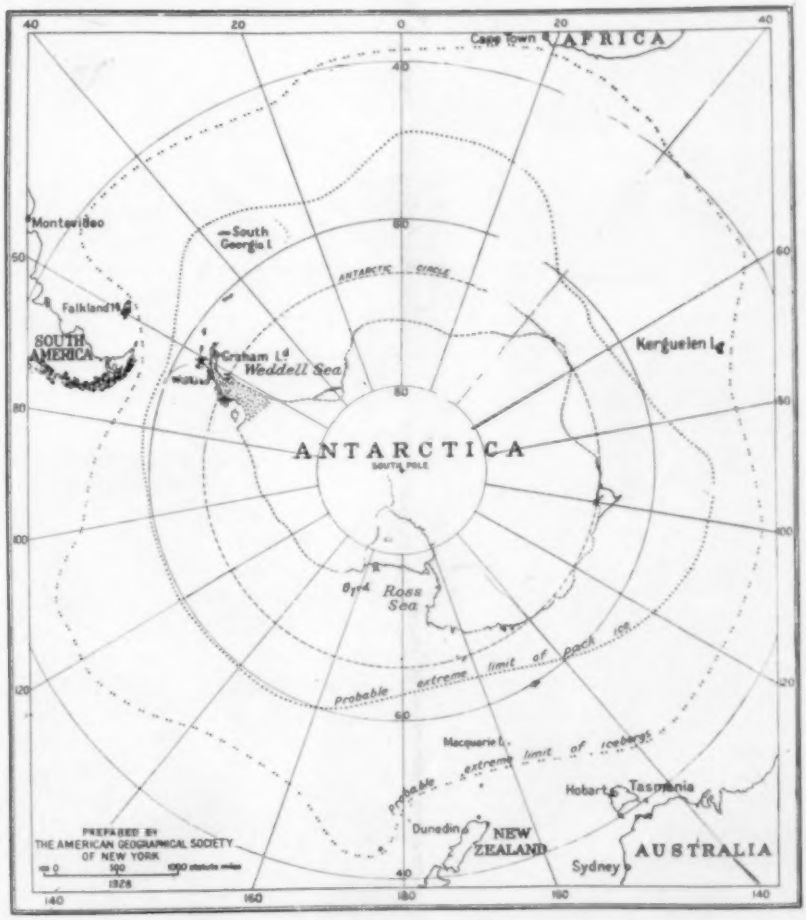

THE LAST UNKNOWN

Where Byrd and Wilkins Fly

(See page 400)

Vol. XIV No. 403

"Frozen" Weather Assets

Meteorology

Science in general, and especially meteorology, the science of the weather, is like a business with many of its assets "frozen" and unavailable to the people who need to make use of them. So declared Dr. W. J. Humphreys, of the U. S. Weather Bureau, in his address as president of the American Meteorological Society.

"Many investigations that deal directly with each particular science, and especially so many more that deal with it indirectly, are lost for years, if not forever, in the jungle of journals and tangle of tongues," Dr. Humphreys said. "In this sense meteorology, to be specific, is actually one of the poorest of all sciences. Its assets, indeed, are amazingly great and rapidly accumulating, but they are frozen to such a depth and breadth that only a Hercules could make them liquid—available for power and light, and able, besides, to change the forlorn desert of our ignorance to an inspiring field of knowledge."

Some of these frozen assets are the thousands of observations of temperature, atmospheric pressure, wind speed and direction and rainfall that are made daily, the world over. They are used for the prediction of future weather, and then become immediately buried in the thousands of records made the next day. Though these records are published periodically in summaries, for many investigations only the originals will serve.

As a specific asset that should be made more liquid, Prof. Humphreys cited the collection of over 4,000 photomicrographs of snow crystals, that have been made by W. A. Bentley, of Jericho, Vermont. A few of these have been published or used as suggestions for art patterns. In the main, however, said Dr. Humphreys, "this great wealth of material lies unused in the keeping of the patient genius who accumulated it. On any day so simple and so common a thing as a carelessly discarded cigarette, or so inevitable an event as the snapping of the thread of a single life, may indeed destroy utterly, or scatter to the winds this unique collection of a lifetime."

The way to make this asset liquid would be to publish a large selection of the pictures in book form, Dr. Humphreys said. To do this would not cost more than an expensive automobile, and would probably be returned with a profit, he stated.

Science News-Letter, December 29, 1928

Shotgun Measures Ocean Depths

Oceanography

Firing a shotgun under water to measure the depth of the ocean was the expedient resorted to by Capt. J. P. Ault, commander of the non-magnetic yacht "Carnegie," now cruising in the south Pacific, when the sonic depth finder was temporarily out of commission.

According to radio dispatches from Capt. Ault to the Carnegie Institution of Washington, owners of the vessel, the oscillator on the ship's keel developed a slight leak. This oscillator sends out a sound wave which travels to the bottom of the ocean, and is then reflected back. It is picked up on the return by a microphone, and the time that it has required for the round trip affords a measure of the depth.

The emergency method adopted was to attach the shotgun to the end of a pipe which could be extended twenty feet below the surface. When the gun was fired the sound waves travelled to the bottom and returned as an echo, just as with the regular echo. Capt. Ault stated that the method checked well with depth measurements by extending a sounding wire to the bottom.

The ship left Balboa, Canal Zone, on October 25 and reached Easter Island on December 4, four days ahead of schedule. This was the first of six passages that she will make of the Pacific. On account of an imminent storm she left Easter Island on December 12, but was driven westward by a gale. On December 16, according to the last word that has been received, she was in latitude 32 degrees south and longitude 111 degrees west. During the Balboa-Easter Island voyage, the scientists made 58 observations of the earth's magnetism, 70 depth determinations by the sonic method, 24 pilot balloon flights, 23 biological stations and a number of other observations.

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INTERPRETING week by week, the latest developments in the various fields of science, this magazine attempts also to present its articles in the most pleasing and readable typography and the most convenient arrangement.

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All of the resources of Science Service, with its staff of scientific writers and correspondents in centers of research throughout the world, are utilized in the editing of this magazine.

Rock Blisters Formed Continents

Geology

New ideas on the formation of continents, of the origin of the Gulf of Mexico, movies of the earth's activity and the future of a vanishing island, as presented to the geologists attending the A. A. A. S. meeting in New York are here described.

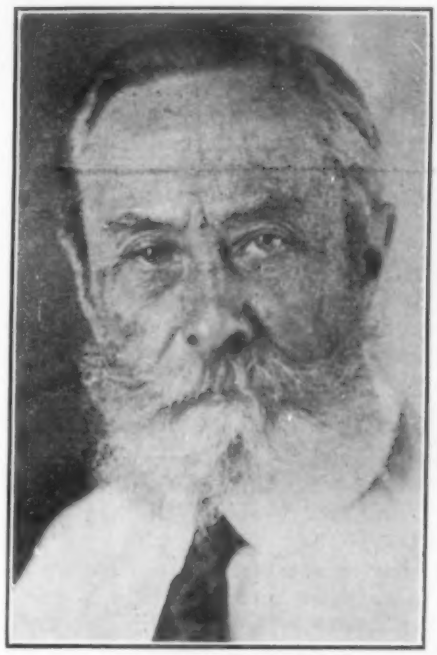
Immense blisters of molten rock, 30 to 100 miles below the surface of the earth, several hundred miles across and sometimes a million cubic miles in volume, taking several millions of years to form and burst, are the cause of continents forming on the earth, Prof. Bailey Willis of Stanford University postulated in his address as president of the Geological Society of America.

The compression of the interior of the earth by gravity is the source of heat that melts the rock to form these fluid masses, Prof. Willis explained in announcing this new idea of continental origin and development. Concentrations of the heat generated by the immense pressures, at places amounting to over twenty million pounds per square inch, occur under the surface layers of the earth and create the great blisters of molten material, to which Prof. Willis gives the name "asthenoliths."

"The cover of the blister consists of crystalline rock and when heated crystals change their form in response to pressure, even while they remain solid," Prof. Willis said in explaining how the asthenoliths break. "The lower part of the cover is heated and is squeezed between the weight of the upper layers and the incompressible magma. The crystals grow sidewise, horizontally, and in so doing exert pressure against the rigid portion of the Earth's crust around the margin of the blister. As the blister grows this pressure increases and the cover eventually presses out at the margins and breaks. The break will not be vertical, but sloping outward, what in mechanics is called a shear.

"Eruptions of magma follow the break and rising beyond the blister build up the adjacent surface. Partly emptied, the blister diminishes in volume and the cover must sink, cracking and allowing molten rock to rise through it. There will result a depression or basin, equal in volume to the magma that escaped at the sides.

"Such is the origin of the smaller depressions that are the deeper parts of ocean basins. Volcanic ridges, which often carry lofty volcanoes like Teneriffe, the Windward islands of the Caribbean, or the Hawaiian



PROF. BAILEY WILLIS

chain, surround them. Eruptions occur from time to time in their floors and the beds of the basins are known to consist of basalts, a common kind of magma."

During this process the more siliceous minerals of granite, the gray, pepper-and-salt rock, separate out first, Prof. Willis explained, forming the masses of rock that constitute the heart of continents.

"A very large number of eruptions, a great many asthenoliths, an enormous lapse of time must have been required to form Africa, Eurasia and the Americas in this way," Prof. Willis said. "But the ages need not embarrass us and the complex structure of each of the continents corresponds with the multiplicity of actions required by the theory.

"Is the Earth dead? Are the ocean basins and continents made and finished? Are there no active asthenolithes? And if there were what would you look for? Why a depressed area, margined in part at least by volcanic zones, bordered by lands composed in their foundations of older eruptive rocks.

"There is the great deep off Japan and the chain of volcanoes dominated by Fujisan. There is the deep off the Aleutian islands with Katmai and many another volcano. There is the Atacama deep off central Chile and the volcanoes that rise in the Andes. There are many others in the Pacific, and the East and West Indies. Only the Atlantic region appears now to be relatively cold, though perhaps warming up to become active some millions of years hence."

Mexican Gulf New

A hundred million years ago there was no Gulf of Mexico, Prof. Charles Schuchert of Yale declared in his vice-presidental address before the geological section of the American Association for the Advancement of Science.

Not until the geological age called Cretaceous, the end of the age of reptiles, when the dinosaurs were on the decline and the birds and mammals were in their childhood, did that deep water basin come into being and then it was at least three times its present size.

Then the area of the Gulf of Mexico, northern Central America, most of the Greater Antilles, all of eastern Mexico and all of the Gulf States from Texas north to Illinois and east to Florida was submerged by this greater gulf of marine waters. This condition endured for some tens of millions of years, and then in Miocene time began elevating movements that have continued intermittently to the present, bringing on the geography as we now know it.

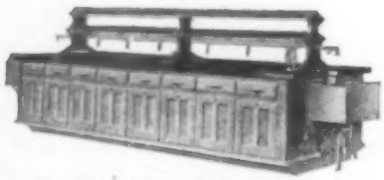
"When the flood was greatest, Costa Rica and Panama had grown from the bottom of the Caribbean Sea through Vulcan's outpourings until they had piled up the land bridge uniting North and South America," Prof. Schuchert said. "Costa Rica, however, soon subsided and the Caribbean again sent its Gulf Stream into the Pacific during another ten million years. Then came permanent closure through elevation, along with more volcanic activity. The Gulf of Mexico shortly afterward, geologically speaking, began spilling across the Tehuantepec region, and this new portal remained an open seaway into the Pacific for a few million years. Decided elevation then set in almost everywhere and soon all was land again between Central America and Mexico; and the plants and animals have had dry land for intermigration between North and South America ever since.

"When Costa Rica-Panama became dry land (*Turn to next page*)

For the Teaching of Chemistry

For the teaching of Chemistry, as well as for instruction in other sciences, it is generally admitted that there is no equipment that enjoys the prestige and reputation among educators to the extent of

Kewaunee Laboratory Furniture



Chemical Desk No. 862

This desk, with exposed plumbing and trough, is a favorite and has been installed in many laboratories. The gas and water pipes, with convenient outlets, are placed under the lower shelf and directly over the trough. The trough is lead-lined and slopes from the middle toward the two end sinks. Accommodates sixteen students, working in sections of eight.

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the importance of properly-designed, properly-built laboratory furniture, and how much influence it exerts upon the character of work of the students.

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Geological Meetings—*Continued*

for the first time, at the eastern end of the Caribbean Sea there also began to rise from the depths of the Atlantic Ocean a long string of submarine volcanoes, and about 50 million years ago the northern half of them appeared as the Caribbee volcanic islands, many of which have ever since retained intermittently active volcanoes. The newest of these volcanoes are the southern Caribbees.

"The present geography came into existence more than a million years ago, but during this short geological interval the islands grew somewhat larger when northern North America and Europe were deeply covered by ice, but shrunk to their present dimensions when these ice sheets melted back into the ocean, thus returning the water that had been taken from it."

Earth's Activity in Movies

The earth growing before one's eyes, streams in flood, volcanoes erupting, waves smashing, portrayed on a motion picture film, will play an important part in the education of future geologists, Prof. Kirtley F. Mather of Harvard predicted to the Geological Society of America in exhibiting special reels of educational motion pictures.

Laboratory experiments can be made once under ideal conditions and shown to large classes many times without the danger of failure if they are recorded on movie film, Dr. Mather said. Animated drawing showed how earthquake vibrations travel through the interior of the earth and record themselves on seismographs.

Island to Vanish Again

Falcon Island, the jack-in-the-box of the Pacific, which has two disappearances and three volcanic reappearances to its credit, will be again destroyed by the waves within a few years if there is no further volcanic action, the Geological Society of America was told.

Profs. J. Edward Hoffmeister and Harold L. Alling of the University of Rochester and Prof. Harry S. Ladd of the University of Virginia reported the results of a visit paid the South Pacific volcano last summer just two weeks after a violent eruption. The island, two miles in diameter and 365 feet high at its peak, rose above the sea in October, 1927. It is composed entirely of ash and other volcanic material. The crater is occupied by a boiling sulphurous lake that rises and falls with the tides.

Science News-Letter, December 29, 1928

The Origin of "Protoplasm"

Biology

D. F. Fraser-Harris in *Coloured Thinking* (Brentano's):

We cannot think nowadays of living things without thinking of the name for the living substance itself, protoplasm, or "the physical basis of life", as Huxley called it in his famous definition. The word protoplasm, which is the Greek for the "first-formed thing", was first used by a Bohemian physiologist, J. E. Purkinje, in the year 1839 to describe the living substance composing animal embryos as in the egg, material not as yet even differentiated into the embryo. Soon biologists began to use "protoplasm" to describe living substance wherever found, whether in plant or animal, in the embryo, in the young or in the old.

No less a man than Goethe himself coined the word "morphology", which is the proper term for the science of the study of the form or structure of an animal. "Anatomy" is the more familiar term, but anatomy means merely a cutting up. As a term, "anatomy" has no reference to the structures laid bare by the cutting up, whereas morphology means precisely a discourse about forms.

From visible forms we may pass to invisible, and at once think of "microbe." This is rather an interesting word, because, as it stands, it means in Greek a short life rather than a small living thing. It is, however, always in the latter sense that it is used, and in this sense it was coined by a friend of Pasteur, the French surgeon, Charles Sedillot, in 1878. The allied term "bacterium", now in such general use for one of the species of microbes, was first employed in its present meaning in 1865 by the well-known French physician, Dr. Casimir Davaine, the discoverer of the germ of anthrax.

Science News-Letter, December 29, 1928

A bronze tablet has been placed on the house at Oberlin, Ohio, where Charles M. Hall, a young college graduate, discovered the first commercial process for making aluminum, in 1886.

Controversy Called Method of Science

Psychology

Science, the search for truth, is advanced by indulgence in personal prejudice and scientific controversy properly checked by persistent self-criticism, Prof. Edwin G. Boring, director of the Harvard Psychological Laboratory, contended in his presidential address before the American Psychological Association. Prejudice and controversy are considered by Prof. Boring to be symptoms of the same driving force that makes men invent and discover.

"The history of science is full of illustrations of the most violent and seemingly unreasonable controversy that have obscured the truth for long periods and only eventually led to established fact," said Prof. Boring. "Mesmer's discovery of mesmerism (or hypnotism) is a case in point and much can be said in favor of Mesmer who is generally disregarded as a charlatan. John Elliotson's rediscovery of hypnotism half a century later is a similar case where personal prejudice blocked the acceptance of discovery."

"Since science is supposed to seek the truth, it would appear that its efforts should be directed toward the elimination of bias and personal prejudice wherever these factors enter into the formation of scientific conclusions. However, it appears that the greatest scientists are often the most prejudiced in maintaining their personal views, and that the personal dynamic urge that leads to violent and personal controversy is also a symptom of the driving force that makes men scientifically productive. This fact of dynamic psychology makes it appear at first as if scientific progress must depend upon individual prejudice and as if scientific truth therefore would always transcend the individual and become, after controversy, the property only of those who have not contributed to its discovery."

Prof. Boring observed that all new scientific movements are controversial in their beginnings. At the start they are not positive but negative.

"Scientific psychology itself began as a reaction against philosophical psychology," he said. "The newest movements, like Gestalt psychology in Germany and behaviorism in America, exhibit mostly this negative side. Scientific movements are therefore great prejudices that sometimes stimulate progress and sometimes prevent it. The question arises therefore as to whether movements of this sort, which are generally looked upon as constituting the milestones in scientific advances, might not hinder progress as much as they encourage it."

The personal bitterness that hinders scientific progress will be removed, Prof. Boring declared, as soon as the mental conflict essential to research is recognized and controlled. He advised psychologists to develop dissociation of personality so that after allowing personal prejudice to stimulate research, self-criticisms can be made to apply the proper checks.

Science News-Letter, December 29, 1928

Magic and Medicine

Psychology

Magic and medicine are close relatives, chiefly because the element of deception is so strong in both, declared Prof. Lynn Thorndike of Columbia University.

"If nature alone works most cures, neither magic nor medicine will admit this. A confidence game is practised on the patient, who must be cheered and distracted," said Prof. Thorndike. "Where the priest used to tell the sinner to go on a pilgrimage, the physician tells the patient to play golf or sends him to Florida."

Prof. Thorndike reminded his audience that the old magician or priest did the best he could with the available material and suggestd that we should not be too scornful of magic.

"Was the world and his milieu actually more topsy-turvy and terrifying to the believer in magic, than to the modern believer in medicine?" asked Prof. Thorndike. "Or did it all seem as matter-of-fact and casual to him as tornadoes in Florida, floods on the Mississippi, germs in towels and drinking cups, and a thousand falling at our side from bootleg liquor and ten thousand at our right hand from automobile accidents, do to us?"

Science News-Letter, December 29 1928

Intern System Urged for Schools

Education

The present scheme of compressing education into a few of the earliest years and of stopping it abruptly at some year in the teens was challenged in an address by Dr. A. I. Gates, of Teachers College, Columbia University, before educators attending the meeting of the American Association.

"The old notion that the teens comprise the prime of life for learning has been definitely disproved," Dr. Gates stated. "The decade from twenty to thirty is superior to any other."

To secure the advantage of education in the valuable years of the late teens and early twenties, and to make schooling more useful by relating it directly to the needs of practical life, he advocated a gradual transition from the life of school to life in the world. This method is already used and found satisfactory in medical training, where young doctors serve an internship, and Dr. Gates recommended that young people being trained to carry on the world's work and soon to take civic and social responsibilities should complete their education by a "social internship".

Recent research has dealt a blow to the old tradition that highly abstract subjects as Latin, mathematics, and physical science are useful because of their disciplinary value to the mind, the speaker said. Prof. E. L. Thorndike has shown, Dr. Gates declared, that these subjects excel very slightly, if at all, such subjects as civics or biology or even stenography, manual arts, or cooking as means of increasing the student's general ability to think.

Underaged Children Make Good

In almost every community the school doors are frequently besieged by mothers asking admission for children who are just a little too young. Some of these children are mentally and physically ready for school, and it is possible to predict with reasonable accuracy whether a child of this sort will make good in kindergarten or first grade, if given his chance, Dr. Edward A. Lincoln, of Harvard University, told the educators.

In an experiment conducted by Dr. Lincoln, underaged children who applied for admission to school at Winchester, Massachusetts, were given an intelligence (*Turn to next page*)

Tears Express Relief

Psychology

The puzzling paradox of crying from joy and crying from sorrow is not so contradictory, because the tears are due to mixed emotions. This is the conclusion of Dr. Frederick H. Lund, of Bucknell University, and Dr. H. V. Pike, of Danville State Hospital of Pennsylvania, reported to the American Psychological Association.

The psychologist and doctor, who conducted an investigation of the tendency to weeping among mental and nervous patients, reported that neither joy nor sorrow, dejection nor elation in a pure form is very effective in causing tears. In mentally diseased cases, where emotions can be readily observed because they occur in more pronounced form than in normal people, they found no case of weeping in the midst of a depressed psychic state. Typically, crying occurs when a depressing situation gains a redeeming feature, or when tension and unpleasant sensations are replaced by alleviating circumstances, they found.

Activity of the nervous systems of the body during emotional states is such as would fit in with the psychological condition of mixed emotions leading to tears, the investigation showed. *Science News-Letter, December 29, 1928*

New Calendar Aids Schools

Pedagogy

Education would be simplified if the simplified thirteen-month calendar were put into effect, the House Foreign Affairs Committee was told in a statement by Joy Elmer Morgan, editor of the *Journal of the National Education Association.*

The committee is holding hearings on the proposal to have the United States join in an international conference for the simplification of the calendar.

Mr. Morgan declared that the simplified calendar would be a great advantage to the schools, for the following reasons:

1. It would reduce the number of facts which children are obliged to learn.

2. It would make the month used by people generally, harmonize with the four-week month which is in use by the schools.

3. It would make the comparison of statistics as between one school month and another more easily understood.

4. It would enable schools to plan for fixed holidays which would be the same year after year.

Science News-Letter, December 29, 1928

Rare Science Works Shown

History of Science

Rare scientific books and manuscripts, including one with the Latin original of the rhyme "Thirty days hath September," were on view during the meeting of the American Association for the Advancement of Science at New York. The exhibition was held in the Avery Library at Columbia University.

Many of the rare manuscripts were from the George A. Plimpton library, said to be one of the finest collections of educational source materials in existence. The "Thirty days" rhyme is contained in a manuscript copy of a work on the calendar called "Computus cum Commento" by Anianus. This manuscript is dated 1384 and is the oldest known copy of a book which, after the invention of printing about 1450, went through 50 editions in thirty years. Another treasure that was shown in a manuscript copy of "De Temporum ratione," by the Venerable Bede, who lived from about 673 to 735. This copy was made on vellum in 1129, directly from the original, and is notable for its beauty, accuracy and age.

Science News-Letter, December 29, 1928

Education Meetings—*Continued*

test. Children who were found to be mentally advanced beyond their real ages were placed in regular public school classes.

Careers of these youngest pupils have been followed through the seventh grade in as many cases as possible, Dr. Lincoln reported. Out of 54, only four slipped back a grade, and in these four cases sickness and home conditions were responsible. The rest averaged well in their studies, especially in reading.

The school careers of 18 underaged children that were refused admission to school on the basis of their mental test scores were also followed. These children probably would not have made good in the kindergarten or first grade if they had been admitted early, Dr. Lincoln pointed out, since most of them did not achieve high standing even when they went through the grades at the usual ages.

The plan of giving mental tests to underaged children who try to enter school has spread to a number of Massachusetts towns. Four hundred children were tested by Dr. Lincoln in twelve towns this year. The plan saves a year later on for the bright child, who is likely to go farther with his education, he stated, and it also serves to demonstrate to school officials the possibilities in modern educational procedures.

Geography Losing Place

High school boys and girls do not "pick up" much geography while studying their other lessons, as optimistic educators think that they do, Dr. Nels A. Bengtson, of the University of Nebraska, pointed out to geography teachers.

Geography is being pushed out of the school curriculum, chiefly by general science courses, he stated, and the idea is widespread that the students will acquire knowledge of the world they live in incidentally, without giving special time or effort to it.

A test given to more than 900 high school students taking American history was described by Dr. Bengtson. The boys and girls were asked 65 questions, such as: "Name the physical barrier that helped most to make for unity among the colonies in the war for independence." The students' struggles with the question yielded 60,580 answers and only 21,869 answers were correct.

Science News-Letter, December 29, 1928

The Last Unknown

Geography

The last great unknown, the Antarctic continent, is being explored. The map on the front cover of this issue will allow you to follow the flights of the Wilkins and Byrd expeditions as they are reported in the daily press. Upon the base map prepared by the American Geographical Society there have been spotted the base camps of the two expeditions. The dotted area in Graham Land shows the approximate extent of snow and ice expanse explored by Wilkins and Eielson on their first flight of December 20, when they discovered that Graham Land is a series of islands and not a part of the continent. Capt. Sir George Hubert Wilkins and his party are based at Deception Island off the coast of Graham Land. Commander Richard E. Byrd and his party are to be based at the Bay of Wales, the point on the Antarctic continent from which Amundsen began his trip to the first attainment of the South Pole.

Science News-Letter, December 29, 1928

Greenland is covered with ice except for a border of land from five to 100 miles wide around the edges.

Would Show Candle at 41,000 Miles

Astronomy

What may be done with the new telescope planned for California is here described in the words of one of America's distinguished astronomers, as presented at the scientific meetings in New York.

Place a candle 41,000 miles away from you—at about a sixth the distance of the moon. The light from it would be about the same as that of a twenty-fifth magnitude star, the faintest that will be revealed to astronomers with the new 200-inch telescope planned for the California Institute of Technology.

At the meeting of the American Astronomical Society, held in conjunction with the American Association for the Advancement of Science, some of the possibilities of the new instrument were explained in an address prepared by Dr. Walter S. Adams, director of the Mt. Wilson Observatory. The observatory is a neighbor of the California Institute, and the two organizations will cooperate in the building and use of the new telescope. As illness prevented an eastern trip for Dr. Adams, his address was read by his associate, Dr. Seth B. Nicholson.

"The efficiency of such an instrument in rendering visible faint stars will be extraordinary," said Dr. Adams. "The mirror will collect about one million times as much light as the human eye, and with all allowance made for losses in the telescope a factor of 700,000 should be conservative. As compared with the 100-inch telescope at Mount Wilson, the new telescope will have four times the surface, and an additional factor of advantage in its relatively short focal length as compared with aperture. It seems probable, accordingly, that it will show stars at least five to ten times fainter, and the gain may be even greater.

"With the 100-inch telescope stars of the 22d magnitude have been photographed, so that the 200-inch instrument may be expected to reach stars of nearly the 25th magnitude. In other words, stars may be observed whose apparent brightness as compared with Sirius is less than that of Sirius as compared with our sun. The brightness of a 25th magnitude star is about equal to that of a standard candle flame of the same color seen at a distance of 41,000 miles or one-sixth of the distance from the earth to the moon."

With the massiveness and light-gathering power of the new telescope, it may prove of value in ways that can not now be foreseen, he said.

"When the 100-inch reflector on Mount Wilson was designed, no one could foresee that by means of a 20-foot interferometer beam placed across the end of its tube the first measurement of the diameter of a star would be successfully carried out," stated the speaker. "In the case of the telescope it seems reasonable to predict that the brightness of the stellar and planetary images formed by the 200-inch mirror will make it possible to apply methods and instruments of analysis which hitherto have been limited to the sun or to bright sources of light in the physical laboratory. The possibilities in such directions form a most interesting field of study, both for the physicist and the physical astronomer."

The ability to gather more light than any other such instrument will shed new light on the spiral nebulae, our neighbor "universes".

"These immense systems of stars form the most conspicuous examples of a sequence of structural forms, apparently genetic in character, which includes all the spiral, elliptical, and globular nebulae," he said. "Their total number is enormous, a million or more being within reach of the 100-inch reflector, with the probability that the 200-inch will increase this number several fold.

"In some five or six of these objects Hubble has been able with the aid of the 100-inch telescope to resolve a part of the nebulosity into individual stars. Among these he has succeeded in identifying some as variable stars of the type known as Cepheids. The application of the method developed by Shapley for the determination of the luminosity of such stars then leads directly to values of the distances and dimensions of the nebulae in which they occur. In this way the distance of the Andromeda nebula has been found to be 870,000 light years, or about 5,000,000,000,000,000,000 miles, and its diameter approximately 45,000 light-years. The light which it gives out is about a billion and a half times the light of our sun, and its mass is probably five hundred million to a billion times as great. In other words, it is a huge universe of stars comparable to, but somewhat smaller than our own.

"The Andromeda nebula is one of the two largest and presumably nearest of the spiral nebulae. Among the millions of other spirals only three or four more can be studied in a similar way with existing telescopes. The assumption, then, that the fainter, smaller nebulae are similar systems but more distant in proportion to their faintness, although partially justified on independent grounds, rests on a slender foundation—our knowledge of stars of known types in half a dozen of the nearest systems.

"The new reflector will add very greatly to these meager results. A conservative estimate is that it will furnish reliable distances for 25 or 30 nebulae, instead of the present five or six, and less accurate values, but sufficient for statistical purposes, for possibly 200 more. Provided with representative material of this quality and extent the astronomer can venture upon the exploration of more distant space with a new order of confidence. From our present knowledge it seems probable that the 200-inch telescope will show nebulae of average size and brightness out to a distance of the order of 400,000,000 light-years, a minute appreciable fraction of the finite universe postulated from the theory of generalized relativity."

Other important uses of the telescope will be in the study of the spectra of the stars on a much larger scale, and in the measurement of the heat from the stars, and planets. In fact, he stated, it will really be possible to make a "weather map of Mars" because of the measurements that will be possible of Martian temperatures.

But unless a good location is selected, the new instrument will be limited in scope.

"The atmosphere introduces a blurring and lack of definition into the telescopic images which impairs the accuracy of measurement, conceals the finer details of the surface of the sun or planets, and by spreading out the light reduces greatly the limiting brightness of the faintest star the astronomer can see with his eye or photograph on his plate," Dr. Adams said. "This quality of the images of celestial objects as affected by the earth's atmosphere, which astronomers for brevity call 'seeing', is the most important consideration in the location of any large (*Turn to next page*)

What 200-Inch Telescope Will Do—*Continued*

observatory. Good seeing is far more vital than transparency of the air, or within reasonable limits, even than clearness of the sky. Except in one or two special lines of work, few astronomical results of value can be obtained when the images given by the telescope are poor and ill-defined.

"The cause of so-called 'poor seeing' is easy to understand. Light in passing through the atmosphere is refracted or bent, and the amount of this bending varies with the temperature and density of the air. Consequently, when masses of air of different temperatures or densities pass rapidly in front of a telescope they refract the light of a star by different amounts, and the combined result is a quivering and blurring of the star's image, and the obliteration of planetary or lunar details. The twinkling of stars when seen with the naked eye is a familiar illustration of this effect, and extreme cases may be seen on any summer day in the desert where the heated air rising from the sands produces grotesque distortions of distant objects.

"As a result of the experience of observers in many part of the world, it is clear that the most favorable site for a telescope should be in a region in which the atmospheric conditions are very uniform, where abrupt changes of weather are infrequent, and where the average wind-velocity is low. Such conditions are probably most nearly fulfilled in those portions of the zones of the earth's surface lying between latitudes 30° and 35°, within which the so-called 'Mediterranean' type of climate prevails. This climate is characterized by wet and dry seasons, with a long nearly uninterrupted period of clear skies followed by a shorter period of unsettled weather with moderate or low precipitation.

"Speaking in general, therefore, the most advantageous location, so far as our present knowledge extends, would lie in a region having the Mediterranean type of climate, at an elevation sufficient to be above the fog and haze of the lower strata of the atmosphere, but not so high as to be subject to the intense cold and strong winds of the loftiest mountains. A height of some 4,000 to 8,000 feet has been found to meet these conditions adequately. In the high veldt country of South Africa, in some of the countries bordering the Mediterranean Sea, and in the extreme southwestern portion of the United States, including Central and Southern California and a part of Arizona, are probably the best locations which astronomers at present know for the most efficient operation of a large instrument."

Lunar Heat and Cold

Bathing in molten sulphur at noon and skating on frozen alcohol at night, would be possible for inhabitants of the moon, if there were any and they were physically able to stand the temperature extremes.

At the meeting of the American Astronomical Society, Dr. Seth B. Nicholson, of the Mt. Wilson Observatory, told of his researches in collaboration with Dr. Edison Pettit on the temperature of the moon.

The researches were made with the use of a thermocouple that converted the faint heat rays from the moon into electricity. A very thin glass was used to separate the light reflected from the planet from the heat. With observations without the thin screen, the total of both heat and light was measured, and with the screen the heat was eliminated, so that the difference was due to the heat.

When the sun is directly over a point on the moon's surface, that is, when it is lunar noon, the temperature reaches about 265 degrees Fahrenheit, higher than the boiling point of water, and high enough to melt both sulphur and iodine. For about a thousand miles on all sides of such a point, where the sun is directly overhead, or about an eighth of the entire area of the moon, the temperature is always above the boiling point of water.

An indication of what the dark, unilluminated side of the moon may be like was obtained when the astronomers made measurements during a recent lunar eclipse. A series of temperature measurements of a single point were made. Before the eclipse began, the temperature was 156 degrees Fahrenheit. At the end of the total phase it had dropped to 196 degrees below zero, Fahrenheit, the freezing point of alcohol. Half an hour after the eclipse was over, the temperature had returned to 135 degrees, nearly as hot as at the beginning.

The moon is thus shown to be of very low temperature conductivity, Dr. Nicholson pointed out. Of all the heat that falls on it, only about 6 per cent. is absorbed into the material, the rest being immediately reradiated away. During the short space of an eclipse, about a third of this is conducted out to the surface, and then radiated out into space.

Sunburn Rays Increase

People in Florida, southern California and Cuba may now be able to get a little more sunburned than they could a few months ago, for the ultraviolet rays of the sun, which cause sunburn, are now increasing. So reported Dr. Edison Pettit to the American Astronomical Society.

At the Mt. Wilson Observatory in California, Dr. Pettit has been making observations of the intensity of ultraviolet light for four years. The method is by comparing the radiation that penetrates a thin gold screen with that penetrating a thin one of silver.

Since the first observations were made in June, 1924, the monthly average intensities have on two occasions been half again as great as they were in that month. These were in October, 1925, and February, 1927. In no month since June, 1924, has the value been as low as it was then, though in September last it was only about 12 per cent. greater than at that time. The variation closely follows the number of sunspots, Dr. Pettit announced, and now seems to be increasing.

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Explains Development of Plant Disease

Botany

The following reports illuminate some of the highlights of papers presented at the sessions on botany, plant pathology, forestry and allied sciences at the meeting of the American Association for the Advancement of Science.

The involved sex life of the rust diseases of plants, some varieties of which cause millions of dollars' worth of damage to grain crops, was the subject of discussion by Dr. J. H. Craigie of the Dominion Experimental Farms, Winnipeg.

A rust fungus has a complex life history. Each spore cell that carries its life through the winter sends out a little thread, which divides on the end and produces just four new spores. These first spring spores drift on the wind to young leaves—in the case of wheat rust, to barberry leaves—and there sprout and take hold. They produce little spots of growth, called pustules. If a pustule grows on a leaf by itself it produces no new spores; but two, growing side by side, often coalesce in what appears to be a true case of vegetable mating, and a cluster-cup of a third type of spores appears, which are the reproductive bodies that carry the fungus back to the wheat or other host.

These cluster-cups always grow on the under side of the leaf. Directly above them, on the opposite surface, grow other diseased spots, producing tiny spore-like cells whose function has never been discovered, together with a nectar-like secretion. Dr. Craigie has taken drops of this nectar and inoculated them into the young cluster-cups, with the result of greatly increasing the rate of reproduction in them. This is the first hint botanists have gained that these upper-surface spots have any significance at all in the life of the fungus.

By exceedingly delicate miscroscopic manipulation, Dr. Craigie has been able to separate out and plant where he pleased each of the four first spring spores of two different species of rusts. He finds that each of these sets of quadruplets seems to pair off into two "male" and two "female" spores; except that because they can not be told apart by looking at them they are called merely "minus" and "plus." Pustules developing from spores of opposite sign developed cluster-cups when they fused, strong evidence that even in so reduced an organism as this parasitic mould genuine sex has been retained.

Flax Poisons Fungus

Flax attacked by a fungus disease forms a substance in its sap poisonous to the fungus, somewhat as a man attacked by a bacterial disease forms in his blood a substance that will drive out the bacteria or at least render their toxins harmless. Experiments demonstrating this internal chemical warfare of plants were described before the physiological section of the Botanical Society by Dr. Ernest S. Reynolds, of Washington University, St. Louis.

Dr. Reynolds has extracted from the sap of flax plants a substance which will prevent the growth of fungi, especially of the fungus causing the serious flax wilt disease. When much diluted, it seems to act as a stimulant to the growth of the fungus, but in the concentration in which it occurs in normal sap it wholly inhibits the parasitic growth. Chemical analysis shows the substance, whose exact composition is still unknown, to contain the deadly cyanogen combination.

Plants Want Full Light

The full white light of day, without any tinkering or subtractions, is what plants can do their best work on, Dr. Hardy L. Shirley of the Boyce Thompson Institute for Plant Research has discovered. He grew buckwheat, sunflowers and a couple of species of weeds under various conditions of light and shade, and under colored panes of glass that cut out certain parts of the solar spectrum. Some plants liked to be partly shaded, as they showed by their response in making stem and leaf substance; but they all preferred white light to any fractionated product. Where they had to do without part of their light, they were better off without the red end of the spectrum than without the blue.

Dr. Shirley also told his fellow plant scientists about a new instrument he has devised for the measurement of natural light in the field, always a difficult undertaking. By soldering together many turns of two different kinds of wire he produces an instrument that converts the radiant energy of the sun into a minute electrical current, which may be measured directly with a microammeter. The whole set may be assembled at a cost of from $50 to $100, weighs only a few pounds, and is sufficiently rugged to stand the handling of ordinary field travel.

Boston Fern a Hybrid

The Boston Fern, the tough and hardy houseplant that will live even in a modern apartment, owes its vigor to the same process that has successively made great the human strains of Rome, Allemagne, Spain, France, Britain and America—hybridization. Its strong and prolific growth, enabling it to live under conditions no other fern is able to endure, are evidences of that quality with which horticulturists conjure but which they nevertheless as yet understand but little, called hybrid vigor.

The Boston Fern has always been considered a mutation, or "sport", of a non-hardy tropical fern, Prof. Edward C. Jeffrey of Harvard University today told the Botanical Society. But he has lately been making a close study of the minute structure of the cells of this fern, and he has found that "while its tropical forebear is quite normal in the organization of its cells, the structural details of the nuclei in the Boston Fern indicate clearly that it has originated by the crossing of its tropical parent with some other species, as yet unknown.

"The Boston Fern presents an interesting parallel to other hybrids of tropical origin which are able to flourish in cold climates," Prof Jeffrey continued. "The Dahlias and the Cannas are both characteristically tropical but in their numerous hybrid forms can be cultivated far beyond the tropics. It is thus clear that a great future for horticulture may lie in the direction of experimental crossing of forms which are unsuited to particular conditions. The results of such crosses may obviously be of greater value in practical horticulture than either of their parents."

Anesthetics Don't Affect Plant

The sensitive plant, which seems more "human" than other vegetables because of the quickness with which it responds to a touch, is not human at all in its responses to various anesthetics which easily put us to sleep, such as chloroform, ethylene or nitrous oxid. Ether alone has a strong effect on it, Dr. Raymond H. Wallace of Columbia University told members of the Botanical Society. Exposed to a 13 to 15 per cent. concen- (*Turn to next page*)

Botanical Meetings—*Continued*

tration of ether vapor the sensitive plant would not "go to sleep" when touched or shaken; or, if exposed after it had lowered its leaves, would not "wake up" again after the usual interval of quiet. But to other common anesthetics, even in strong concentration, the plant remained nearly indifferent, responding to stimuli almost as though it were surrounded with nothing but ordinary air.

Plant Poison in Walnuts

Penta-hydroxy-alpha - naphtha - quinone. That is the exact name, outlining for the understanding of organic chemists the exact structure of the stuff in walnut trees that keeps the ground under them bare of plant life. The tracing of this walnut poison to its chemical lair was described before the physiological section of the Botanical Society of America by Everett T. Davis of the Virginia Agricultural Experiment Station.

The antagonism of walnut trees to other forms of plant life has long been noted by farmers as well as botanists. It was supposed that the trees poisoned the other plants, but nothing was really known of the nature of the substance until the Virginia researcher extracted and purified it. Having got the natural substance, he proceeded, after the manner of organic chemists, to make a synthetic duplicate of it. This artificial product proved to be just as poisonous to plants as its natural prototype.

Because the full descriptive chemical name is a bit cumbersome, Mr. Davis sought a shorter one for common use. The botanical name for the walnut is *Juglans*, so he called the newly discovered chemical "juglone."

Elms From China

Elms from China are brightening the farms of Kansas and giving relief to the one-time level monotony of the wind-blown plains of the West, Dr. Frank C. Gates, of the Kansas State Agricultural College, told the Botanical Society of America. West of the rolling prairie region the climate is too severe and droughty for the successful growth of the American elm, favorite street and yard tree in eastern states ever since Colonial times. But three species of Asiatic elms have shown their ability to withstand the hot droughty summers and the long, dry winters of the West. The best of the three, known to botanists as *Ulmus pumila*, reaches a height of 60 feet and a trunk diameter of a foot under average Kansas conditions.

Value of Pastures

The net income from pasture land exceeds the returns from crop land, according to Dr. E. G. Misner, professor of farm management at Cornell University.

Outstanding economic importance of our pastures as a cheap source of feed for cattle was emphasized by Dr. Misner, who said that the cost of feeding a cow on pasture is only 25 per cent. of the cost in winter. Records kept in one of the best diary regions of New York for five years showed that the value of milk produced in winter did not pay for the feed used, to say nothing of other costs. In summer the value of milk exceeded all of the costs, but this still did not mak up for the winter losses.

Transportation of cattle feed is expensive enough, so that farmers should realize the economic soundness of improving their pasture lands, cleaning up the land, spreading manure, and then using lime and super-phosphate, he pointed out.

Cucumber Needs No Pollination

A new hybrid variety of cucumber, which will set fruits and grow them to market size without having the flowers pollinated, was described by Prof. Richard Wellington and Leslie K. Hawthorn of the New York State Agricultural Experiment Station. Most cucumbers must have their flowers visited by insects before they will set fruit, and the crop is made to depend on the state of the weather when the flowers are in bloom. Varieties such as the one presented, it was pointed out, will yield a much more certain crop.

Sparks Start Forest Fires

Though not so prolific a cause of forest disaster as the careless camper's fire or tossed-away match or cigarette-butt, sparks from logging and railway engines start many forests fires and should therefore be investigated with a view to their prevention, according to Prof. A. C. Coonradt of New York University.

These destructive seeds of fire, Prof. Coonradt stated, are sown from two chief sources: smokestacks, and the ash-pits in the bowels of the engines. Which of the two is the more prolific in causing mischief has not yet been determined; but since both are trouble-makers both must be taken in hand. There are many good spark-preventing devices, the speaker said, but while they work well when they are new they eventually get out of order and the tendency is to let them stay that way. Efforts to obtain more nearly fool-proof machinery must be continued, for stringent regulations are looked on askance by men of the woods, and are likely to be shrugged aside when the inspector is not looking.

The oil-burning locomotive, hailed as a cure for spark trouble where oil is cheap enough to justify its use, has not been as great a success as was at first hoped, Prof. Coonradt said. Sheets of unburned carbon tend to accumulate in the flue, and then to get projected into the air like shots when the engine is puffing hard; and these are most dangerous carriers of fire.

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In the 15 years between 1851 and 1866, the floods which altered the course of the Yellow River of China took the lives of more than 30,000,000 people through drowning or malnutrition.

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Certified Stains Aid Diagnosis

Bacteriology

War in the world of the invisible occupied the attention of the members of the Society of American Bacteriologists who met at Richmond just after Christmas. Here are some of their new discoveries:

The diagnosis of a number of diseases depends largely on biological stains or dyes. When the doctor takes a swab from your throat for a culture to determine whether or not you have diphtheria, he must use a stain called methylene blue in order to see under the microscope the germs that grew in the culture from your throat. Naturally, the stain must be dependable, or the diagnosis may be inaccurate. For this reason a Stain Commission has been established to certify biological stains.

Thirty-eight stains have been put on this certification basis, Dr. H. J. Conn of the New York Agricultural Experiment Station reported to his fellow bacteriologists. In 1923 almost half of the samples submitted to the commission were refused certificates. In 1928 only 3 per cent. of those submitted were refused, said Dr. Conn, commenting on the improvement in the stain supply. Attempts are being made to secure the cooperation of the Federal Specifications Board in drawing up specifications for stains in harmony with those of the Stain Commission.

A temperature difference of nine degrees Centigrade is significant in determining whether bacteria contaminating water are from intestinal discharges of man and other warm-blooded animals or from cold-blooded animals, such as fish, is the conclusion reached from experiments of the late Laban W. Leiter. An account of the study was reported by William W. Ford of the Johns Hopkins University School of Hygiene and Public Health. Certain strains of a type of bacteria known as *Bacillus coli* from men and warm-blooded animals ferment dextrose broth when grown at 46 C. Certain other stains of bacteria appear to be like *B. coli* in every respect, but they will ferment dextrose broth only when grown at 37 degrees Centigrade. These strains are from cold-blooded animals and are probably of no significance when found in water. The discovery of this difference probably will have an important bearing on the question of detecting sewage pollution in water.

Ultraviolet Light From Bacteria

Substituting machine oil for gelatin as sensitizer of photographic plates made it possible to photograph the ultraviolet light given off by the roots of certain growing plants and by certain bacteria, Ralph R. Mellon, N. von Rashevsky and E. von Rashevsky of Pittsburgh reported to the society.

A European scientist, Gurvitch, found that rootlets of growing onions and certain other plant tissues gave off this light, which is the same that is used to prevent and cure rickets, although of much shorter wave length. He was unable to photograph this light with the ordinary photographic plates. The Pittsburgh investigators, having found a way out of the photographic difficulty, also found that the light is given off by an organism which occurs in sewage and in the intestines and is known as the colon bacillus. The light seems to be due to radiation and to electron emanation and has been (*Turn to next page*)

Insects Could Survive Outer Space

Entomology

Much speculation has been indulged in by romanticists, and even by sober students of the history of life, on the possibility of the transplantation of germs of living matter from an old planet to colonize a new one. Some evolutionary thinkers have suggested that the original spark of life may have been kindled on our own earth in this way. Others have denied such a notion, claiming that nothing could survive the awful emptiness of interstellar space.

But Dr. Frank E. Lutz, of the American Museum of Natural History, told members of the American Association about experiments wherein he had subjected insects to vacuums approaching in completeness the void of outer space. The high-power air pumps sucked out all the atmosphere of the vessels in which the insects were confined, down to a point where a potential of 30,000 volts could no longer produce an electrical discharge; a higher vacuum than obtains in the most modern X-ray tubes. Yet nearly all the insects lived through at least a short exposure to this, and also survived the shock of having normal atmospheric pressure restored almost instantaneously.

In low-pressure experiments where the air was reduced merely to a point where a human being could not have lived, a big milliped, or "thousand-legger", was able to live and run inside of a tiny squirrel-cage wheel built for him, without missing a stroke with a single one of his legs. Instead of slowing down as the air was exhausted, the many-legged arthropod appeared to be "pepped up" by the artificial Himalayan atmosphere, and walked faster and faster.

Insect Studies Aid Culture

Entomology, popularly conceived of a few years ago as a mild form of madness, is due to receive recognition as a distinct contributor to mental development and culture, in the opinion of Prof. Royal N. Chapman of the University of Minnesota, who spoke before the Entomological Society of America. The cultural value of the study of insects, the speaker said, has been overshadowed largely by its great success in the economic field; but though it has received much less formal recognition from the universities of Europe than it has in America, entomology has taken a more firm hold on the minds of those who cultivate it just because it is interesting and mentally useful.

Prof. Chapman told of recent experiences in Europe: "A year ago I was on leave of absence for fifteen months and had the first oportunity to think that I have had since I was promoted to be the head of a department. I saw professional and amateur entomologists in various countries and reflected upon the conditions in America, from a distance. It was my privilege to come in contact with some of the amateur entomologists of Europe. I visited them personally and saw them collectively in the meetings of their societies. I was greatly impressed with their interests and was convinced that most of them went beyond the mere collecting of insects or the mere observing of insects' habits. They reflected upon their observations. They built up a philosophy of life far above that of the average person." (*Turn to next page*).

Bacteriological Meetings—*Continued*

called mitogenetic rays.

Few Germs in Nuts

Nuts do not increase the number of germs in candy. In fact, the nuts themselves have fewer bacteria than candy has, Prof. John Weinzirl of the University of Washington has found. Whatever germs are on the nuts get there from the hands of the persons selling them, just as the germs on candy get there from the hands of the candy salespeople, Prof. Weinzirl reported.

F. C. Harrison and W. Sadler of McGill University, Montreal, reported that the greenish-yellow discoloration on halibut is due to an organism found in large numbers in the artificial ice used for packing the fish in boats. This ice is all obtained from upland waters. The organism is also present in large numbers in bilge waters but not in sea water at a depth of 30 to 50 fathoms nor on freshly caught fish.

Spoilage in tomato products, such as sauces, canned tomatoes and soups, is due to bacteria that produce lactic acid, reported Carl S. Pederson of the New York Agricultural Experiment Station at Geneva, N. Y.

The "waterless process" of canning string beans does not give greater protection against botulism baccilli than the brine method, reported Lawrence H. James of the U. S. Bureau of Chemistry and Soils. Experiments showed that the entire contents of a can of waterless processed string beans may become poisonous from the presence of a single infected bean. The organism spreads just as readily through the contents of the waterless processed can as through the beans canned in brine.

Substitute Bacteriophage

Bacteriophage, deadly enemy of disease germs, is being substituted for typhoid vaccine as a means of protecting persons from typhoid fever, Dr. N. W. Larkum of the Michigan Department of Health reported.

The study has been carried on among inmates of state institutions. The power of the blood to kill disease germs is greater when the subjects are given bacteriophage than when they are given typhoid vaccine, Dr. Larkum reported. A single inoculation of bacteriophage had more lasting effect on the blood than a single inoculation of the vaccine. This has a bearing on the length of time the immunity to typhoid fever will last. Three inoculations of bacteriophage, however, gave less satisfactory results than a single inoculation.

Glass Stops Rays

Experiments showing that the power of sunlight to destroy disease germs is directly affected by passage through glass were reported at the meeting of the society by Theodore W. Hausmann of Concordia College. In the study cultures of germs were exposed to direct sunlight, to sunlight coming through plate glass and through glass transparent to ultraviolet light. Roughly, the number of colonies of germs that developed may be expressed as follows: with no sun, or shade, 11 colonies; with plate glass, 8 colonies; with glass transparent to ultraviolet light, 5 colonies; with direct sunlight, 3 colonies. The number of colonies that develop from a culture indicate to bacteriologists how many bacteria or germs are in the culture.

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Entomological Meetings—*Continued*

Parasites of Parasites

One of the worst pests in a greenhouse is the geranium aphid, one of the so-called plant lice, which every horticulturist knows to his sorrow. It is preyed upon by a little fly-like insect, which destroys it. This insect is in turn preyed upon by another—a secondary parasite, as the entomologists term it. And both the primary and secondary parasites become the victims of still another insect, which thus becomes, in part of its activities, a tertiary parasite.

This dizzy pyramiding of life-and-death battles with microscopic stilettos, in the small green jungle of the greenhouse bench, was described in detail before the meeting of the Entomological Society of America, by Dr. Grace H. Griswold of Cornell University. "As one studies parasites—primary, secondary, tertiaty—one wonders if the end of parasitism is ever reached," she concluded, and harked back to the classic rhyme:

"Naturalists observe, a flea
Hath smaller fleas that on him prey,
And these have lesser fleas to bite 'em,
And so proceed, at infinitum."

Travels of an Insect

An American insect sheriff, pursuing an escaped American insect thug into all corners of the world, and always "getting his bug," was the tale told to members of the American Association by Dr. L. O. Howard of the Bureau of Entomology, U. S. Department of Agriculture.

The dispatch of the parasitic insect known as *Aphelinus mali* on its world-wide clean-up mission has been in the nature of a return for similar courtesies we have received from other countries, Dr. Howard pointed out. He said:

"The United States has purposely imported from other countries many kinds of parasitic wasps and flies to help kill accidentally imported plant pests. In this beneficial work the U. S. Bureau of Entomology has had much help from the officials of many foreign governments, but we have very rarely had the chance to help them in the same way.

"Within the past eight years, however, the U. S. Government has assisted many other countries to introduce and establish an important parasite of the woolly apple aphis, a pest of American origin that has found its way all over the world and has done great damage to the apple orchards of many countries.

"*Aphelinus mali* was carried by hand from Washington to Paris in 1920. It multiplied and was spread through the apple-growing regions of France. The same year it was sent from Washington to Uruguay, where its success was immediate in spite of the diametrically opposed seasons of the Northern and Southern Hemispheres. Since 1920 it has been introduced into Italy, Germany, England, Spain, Belgium, Holland, Switzerland, Austria, the Argentine Republic, Chile, New Zealand, Australia, South Africa and Japan. In very many of these countries it has been a great success, and notably perhaps in New Zealand, Australia, the South American countries and Italy. In nearly all of these countries it has shown itself to be a help in the control of the aphis at certain times; in others its usefulness is very limited.

"*Aphelinus mali* is now more widely distributed all over the world than is any other beneficial insect except the honey bee. It seems to thrive in many different climates and to control the aphis wherever the pest, by virtue of sandy soils, does not descend into the ground and damage the roots of the apple."

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Bits of Worms Like Whole Ones

Zoology

"Turning big ones into little ones" is a simple job with rocks and other inanimate objects. One simply uses a hammer or an ax. But with most living objects such a process of fragmentation is also one of destruction; the pieces are not of the same nature as the original whole, but are just dead bits. That philosophy is so elemental that we usually do not even think about it; to mention it sounds rather nonsensical.

But certain marine worms contradict it successfully, according to Prof. Wesley R. Coe of Yale University. These worms can be cut down to one ten-thousandth of the original size, and still be miniature worms, exactly like the original copy except for their diminished bulk. Except for certain limited regions, any part of the body will yield pieces that will shape themselves into new worms. Twin effects can be produced by partial lengthwise splitting. Nothing seems to hurt the astonishing creatures; in fact, they often throw off bits of tissue that do naturally what Prof. Coe's scalpel did for them in the laboratory.

Even though the piece of worm that is cut off or thrown off contains no digestive or other organs, new ones form themselves spontaneously. A head and tail end differentiate themselves, sense organs develop in the former, as much of a brain as a sea worm needs develops, and the little one is just as good as a big one, and all it needs to do is grow—unless it decides to get a divorce from itself and start two or more new little ones.

Salamanders Keep Eyes

A quick reversal of a degenerative evolutionary process was made when the young of cave salamanders, creatures with permanently closed and useless eyes, were raised in lighted quarters and grew up with their eyes open. This experiment was reported to the American Society of Zoologists by G. K. Noble and Sarah H. Pope of the American Museum of Natural History.

Larvae of this particular species of triton have normal eyes, adults have degenerate retinas and eyelids that are fused together, except near the center, where they usually overlap. Fifty-eight young, reared in the light from 35 to 345 days after they shed their skins, still have open eyelids; 25 control animals kept in darkness show all stages in the fusion of the lids, the experimenters reported.

Apparently, the degenerative process does not always take place in nature, for one specimen has been found in nature with open eyes and retinas complete.

Oysters Mate At Long Range

Oysters, unlike many of the higher animals, do not come into direct contact during the mating process. The female discharges (*Turn to next page*)

Traces Jews' Travels by Speech

Philology

The swarming thousands of New York's East Side are not "just Jews" to the student of languages. They are a complex of race-branches, reassembled in this American New Jerusalem, and each individual betrays in little turns of his speech, or in peculiar words he uses, the pilgrimage of his ancestors. Prof. Max A. Luria, of the College of the City of New York, has made a special study of the dialects of the Spanish Jews of his city and presented a summary of his findings before members of the American Association.

When the Spaniards reconquered their land from the Mohammedans, they expelled all the Jews as well as the Moors. These banished Jews, who have come to be known as the Sephardim, wandered into many lands in Europe and the Near East, but never quite lost their identity, even when in close contact with their coreligionists of other races. The Spanish dialects which they still speak show close relationship to the Spanish of the twelfth and thirteenth centuries. Changes in the meanings of certain of them show Turkish influence. And in some of the words a dropped letter, or a change in the pronunciation of the final vowel sound, will tell in what town a man's ancestors lived half a thousand years ago.

"Sheikh" Elizabethan

The ladies of Queen Elizabeth's court knew about sheikhs, for it was in that age that the Arabic word for the head man of an Arab group was introduced into English. Prof. Philip K. Hitti, of Princeton, speaking before the Lin- (*Turn to next page*)

NATURE RAMBLINGS

By Frank Thone

Natural History

A Feathered Prometheus

The natives of the great forests of Brazil have an interesting legend about one of their birds, a large, beautifully-colored creature known as the Juruva. The most conspicuous mark of the Juruva is its peculiar pair of long tail-feathers, very ornamental appendages, except that out near the tip there is a gap in the vane of each feather, nothing but the bare midrib connecting the broad end with the rest.

The tale, according to Dr. R. von Ihering, well-known Brazilian naturalist, is as follows: Once upon a time all the fires on the earth went out, and nobody could cook or keep himself warm any more. Only in one place, on top of a high mountain, did a few glowing coals remain, and the people down below could see that even these were growing fainter and fainter, and would soon be cold. No man could climb the mountain fast enough to reach this precious last reserve of fire before it was dead. Everyone was in despair. What could be done?

Then the Juruva, friend of man, volunteered to bring a coal, to rekindle the fires on the hearths in the valleys. Swiftly the bird flew over the treetops on the mountain slope. He reached the glowing coals on the summit. They were too hot for him to take in his beak, so he picked one up between the long feathers of his tail. Down the mountain he flew as fast as he could go, dashed into the village where the anxious people waited, and dropped his priceless burden on a heap of straw. Thus were the fires of men rekindled. But the Juruva had burned away his tail-feathers where he had held the coal, and this gap remains near the ends of the feathers in the tails of all his descendants.

Organized, Not Organic

Philosophy of Science

WILLIAM E. RITTER and EDNA W. BAILEY, in *The Organismal Conception: Its Place in Science and Its Bearing on Philosophy* (Univ. of California Press):

Some biologists are somewhat piqued by the serious proposal made by Whitehead to call all sorts of existences, atoms and molecules not excepted, *organisms*. Some scientists are quite willing to speak, in a half-metaphysical sense, of atoms and molecules as having life, especially psychic life; but they feel it is going too far to talk about them as organisms. We share this latter feeling somewhat, but not from any sense of sacrosanctity of the term organism. It is rather a question of whether the organization of an atom has enough attributes-in-common with the defining attributes of the simplest living being to warrant admitting the atom into a class of natural objects which has been so long and usefully recognized as has that of organic nature, in contrast to inorganic nature. We have reached a stage in our interpretation of nature wherein we ought to rid ourselves of the supposition that any part of nature is really unorganized, or inorganic; but this is very different from saying we are no longer justified in distinguishing between not-living, or inanimate nature and living, or animate nature. We need to recognize that all nature is organic, but that one vast subdivision of it is composed of inanimate organic beings while another vast subdivision is composed of animate organic beings.

The biological naturalist hesitates about accepting as alive systems organized on the plan of the solar system or the atomic system until there has been discovered something more tangible than has yet been reported connecting the central bodies (sun and proton) and encircling bodies (plants and electrons); and until something resembling metabolism, reproduction, and response to stimuli is made out for these systems.

Science News-Letter, December 29, 1928

No cases of tularemia have been found in New England or New York as yet.

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*An airplane route from Cairo to Jerusalem covers in less than three hours the journey which the Israelites made in forty years.

Zoological Meetings—*Continued*

her eggs into the water, and the male his sperm, and the myriads of their potential offspring achieve fertilization pretty much by chance as they float.

Yet in spite of this long-range wedding the presence of individuals of opposite sex produces a mutual reaction even in such lowly forms of life, Dr. Paul S. Galtsoff of the U. S. Bureau of Fisheries told the zoologists. A little quantity of the sperm will cause the female to lay eggs copiously. But after thus responding, the female will remain unresponsive to further stimulation of the same sort for several days.

Conversely, the male oyster can be induced to discharge sperm by means of adding eggs to the water flowing about him. Unlike the female, he will respond every time eggs are added.

Electrons Cause Mutations

The mutations, or sudden evolutionary changes, that can be caused by exposing living organisms to X-rays, radium and similar powerful radiations, are probably due to high-speed negatively charged electrons, or beta rays. Such rays are given off directly by radium, and arise as a result of X-ray bombardment of solid matter.

The researches on which this conclusion is based were described before the American Society of Zoologists by Dr. Frank Blair Hanson of Washington University, St. Louis. Dr. Hanson exposed fruit flies to the action of radium, giving different sets of them varying degrees of protection behind thin lead screens. The number of mutations produced varied according to the degree of protection. Then he made measurements of the number of beta particles that got through the same set of screens, and found that these varied in exactly the same numerical proportion as the mutations. In brief, the more intense the beta-ray bombardment the more frequent the mutations.

Heart Beats Backward

The butterfly, immemorially the symbol of inconstancy, has a heart that often beats backward, Prof. John H. Gerould of Dartmouth College told the zoologists. He has dissected numbers of these insects, and has demonstrated this strange behavior many times.

The heart of an insect is in its back instead of its chest, and consists merely of an enlargement in a long blood vessel, much like the bulb in the middle of a rubber syringe tube. A beat will start at its rear end and travel forward, squeezing the blood on ahead of it. After repeating this several times, the heart will pause, and then a beat will start at the forward end, sending the blood in the opposite direction. Occasionally the beat will start in the middle, sending the blood both ways. It seems to make no difference to the butterfly.

Science News-Letter, December 29, 1928

Philological Meetings—*Continued*

guistic Society of America, stated that more than 500 Arabic words have found their way into English, beginning in early times.

Camel and Saracen appear in Old English writings, he reported. In the twelfth and thirteenth centuries, English absorbed such words as admiral, assasin, rice, and saffron. In the fourteenth century came alchemy, cipher, hazard, lute, and syrup. The age of Elizabeth brought not only sheikh but gazelle, jar and tariff. And soon after came harem, jinn, lilac, and minaret.

Arabic words have usually entered English by way of the Spanish, French, or other European languages, Prof. Hitti pointed out.

Direction of Writing

Jews, Arabs and other Near Eastern peoples "write backward," according to Occidental notions, because ancient Egyptian art conventions demand emphasis of the right side-view of the person in action. As picture-making led to picture-writing or heiroglyphics, and this was simplified into easier systems of writing in Egypt and among the nations that learned how to write from the Egyptians, the old art convention remained as a script convention.

This story of the origin of the right-to-left direction of Semitic writing systems was advanced by Prof. N. Reich of Dropsie College, Philadelphia. Only when the much more recent Indo-European alphabets were invented, Prof. Reich said, was this ancient convention abandoned in favor of the left-to-right arrangement now most widely used.

Science News-Letter, December 29, 1928

Tests at the Mellon Institute of Industrial Research indicate that wood flooring has about as much resistance to wear and denting as marble.

FIRST GLANCES AT NEW BOOKS

MAN THE MIRACLE MAKER—Hendrik Van Loon—*Liveright* ($3.50). A distinguished astronomer recently said, "The main difference between a scientific publication and one of literature is that in the former one must be accurate." Using this criterion, this certainly ranks as literature. Evidently the author recognizes this himself, for he says in the second chapter: "If you happen to be a thoroughgoing classification fan, you will discover a great many things in this book which will irritate you most terribly and you had better exchange it for a handbook of botany or a couple of time-tables." Though the subtitle is "The Story of Inventions," don't read it with the expectation of finding a scientific and accurate history of human inventions. But if you want a delightful and interesting story, written in jazzy and frequently inaccurate language (that is, in typical Van Loonian style), and that, in its broad outlines, gives a very fair picture of how man has made himself the lord of the earth, then by all means get this book, and you will be sure of at least a few pleasant evenings.

Invention
Science News-Letter, December 29, 1928

INDUSTRIAL EXPLORERS — Maurice Holland and Henry F. Pringle—*Harpers* ($3). The great revolution of modern industry that research is accomplishing has leaders as colorful as the generals of ancient wars and much more useful. The factual romance contains their romantic stories.

General Science
Science News-Letter, December 29, 1928

FEVER, HEAT REGULATION, CLIMATE, AND THE THYROID-ADRENAL APPARATUS—W. Cramer—*Longmans, Green and Co.* ($6). The book is not primarily intended for the lay reader, but the remarkably clear and interesting style in which it is written recommends it to anyone with even an elementary knowledge of anatomy and chemistry. The subject is an important medical problem which has long been unsolved. The author presents his theories and the results of fifteen years of experimental investigation. To the non-medical reader the discussion of the effects of climate will be most interesting.

Medicine
Science News-Letter, December 29, 1928

FARM PRODUCTS IN INDUSTRY—George M. Rommel—*Henkle* ($3.50). This is the "first book ever printed on cornstalk paper." But it is much more. Agriculture must soon join the growing group of "new industries," founded on scientific research and faced industrially. This book tells how agriculture will emerge from the feed bin into the factory.

Agriculture
Science News-Letter, December 29, 1928

SOUTH AFRICA'S PAST IN STONE AND PAINT—M. C. Burkitt—*Cambridge Univ. Press* ($5). Results of a 6,000 mile archaeological tour made by a well known authority on prehistoric men. Prof. Burkitt's account pays special attention to the stone tools and Bushman paintings, which have been discovered in quantity over wide areas, and hence are most instructive clues to South Africa's prehistory. Of skeletal remains, he has less to say, on the grounds that not enough material has yet come to light to warrant conclusions. The author's report that the country is a "gigantic, wonderfully stocked museum of the past" will undoubtedly serve as an added stimulus to interest in South African research.

Archæology—Anthropology
Science News-Letter, December 29, 1928

SLAVES OF THE SUN—Ferdinand Ossendowski—*Dutton* ($3.75). A traveler's report that has literary personality. The author uses both the story teller's technique and the philosopher's method of speculation effectively to convey to the reader the emotions and thoughts of the African native and the influence that the white man is having in Africa. The subtitle of the book: "The Account of a Journey Through the Western Part of Tropical Africa in 1926" enlightens the prospective reader as to the subject matter, but conveys no suggestion of the depth and breadth of this thought-provoking volume.

Ethnography
Science News-Letter, December 29, 1928

THE BASIS OF BREEDING—Leon F. Whitney—*Fowler*. For anyone who has wondered about heredity, either his own or that of the rest of the animals of the world, this non-technical book will provide much thinking matter. The author is secretary of the American Eugenics Society and has made a hobby of breeding dogs.

Biology
Science News-Letter, December 29, 1928

MAP OF ANTARCTIC — *American Geographical Society (New York)* ($10). Useful for following the airplane flights of Wilkins and Byrd south of the Antarctic Circle is this five foot square, two-color map compiled from original sources and just issued. With the four sheets, into which the map is divided for convenience, there comes an exact duplicate of the navigational chart being carried in the airplanes of the Byrd and Wilkins expeditions. It will vitalize current geography for schools.

Geography
Science News-Letter, December 29, 1928

AEOLUS — Oliver Stewart — *Dutton* ($1). Moving-wing aircraft of the autogyro type will conquer short distance aerial transport, gigantic fixed-wing hydroplanes will ply the sea routes and airships will never succeed. This is the future of the flying machine as written by a British pen.

Aeronautics
Science News-Letter, December 29, 1928

EUGENICS—A new monthly magazine—*American Eugenics Society* ($2 yearly). This journal of race betterment will distribute the facts and theories of heredity and inheritance to that increasing number of quality conscious individuals who are concerned with the future of humanity.

Eugenics
Science News-Letter, December 29, 1928

JOURNAL OF JUVENILE RESEARCH—*California Bureau of Juvenile Research, Whittier, Cal.* ($1.25 a year, 40 cents a copy). A new journal, which will report scientific advances in understanding of children's problems, psychological and sociological. Dr. Norman Fenton is the editor, and the journal is to be published quarterly. The first issue starts off the journal in promising style, presenting results of investigations of interest among the feeble-minded and among juvenile delinquents.

Psychology—Sociology
Science News-Letter, December 29, 1928

EPIDEMIC INFLUENZA—Edwin O. Jordan—*American Medical Association* ($5). Professor Jordan has made a very thorough survey of the literature on the influenza epidemic of 1918. The book will be extremely valuable to public health workers and epidemiologists now and probably to historians of the future. A copious bibliography and many charts, tables and diagrams add to the usefulness of the book.

Epidemiology
Science News-Letter, December 29, 1928

Troubles of the Map-Maker

Cartography

RUPERT T. GOULD in *Oddities: A Book of Unexplained Facts* (Stokes):

Until we know considerably more about the geography of our planet than we do now, there will always be "doubtful islands," distinguished on the Admiralty charts by the skeptical affix "E. D." ("existence doubtful") or "P. D." ("position doubtful").

It may seem curious, in these days of over-civilization, that we should still be in this state of uncertainty. But, in sober fact, we still know much less about the "round world" than is generally supposed, and a small departure from the beaten track may still, in certain parts of the great oceans, and even nearer home, transform the ordinary mariner into a discoverer. An excellent example of this neglected truth is the case of the Belcher Islands in Hudson Bay. Hudson Bay has been known and traversed ever since 1610, and that famous, if somewhat retiring, corporation, the Hudson Bay Company, has maintained trading posts on its shores for centuries past; yet in quite recent times (1915) a group of unknown islands were discovered within the bay (or rather, inland sea) itself, and almost within sight of land. They are quite large islands—several are more than seventy miles long—and they have a total area of about five thousand square miles.

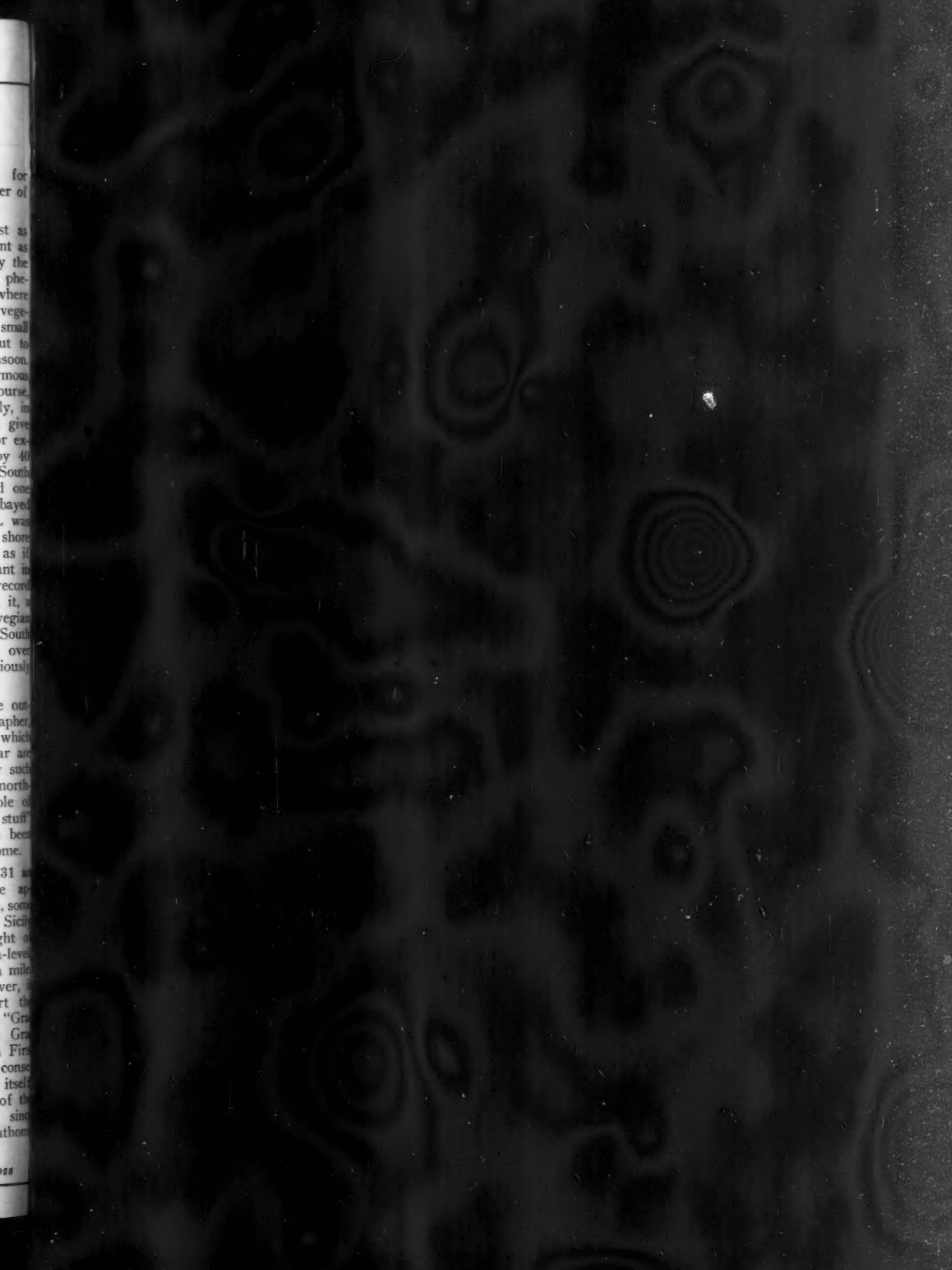
Strictly speaking, they were not absolutely a new discovery. Old charts showed, in their vicinity, one or two little clusters of tiny islets, proving that in times gone by some vessel or vessels had sighted them; but their actual size, extent and position had remained unknown and unguessed-at. Obviously, they are not of recent formation; they merely happen to lie off the ordinary trade route of vessels navigating the bay, and in a region which, until 1915, had never been properly examined.

In the early days of cartography—say until the beginning of the seventeenth century—it was not much more than an even chance that any particular island shown on a chart had any real existence. It was just as likely to have come there direct from the draftsman's imagination; or through a misreading or miscompilation of old and irreconcilable authorities; or as a compliment to a patron of either sex; or in consequence of some political exigency. If it did exist, the only real information which the chart afforded concerning it was that its topography and position quite certainly differed in a very marked degree from their representatio non the paper. Yet some of the non-existent islands, especially if they were charted in unfrequented parts of the ocean, held their place on the charts for what seems an amazing length of time; their vitality is as remarkable as the longevity of the invalid, now recognized by most medical men. Such, for example, was the island of Hy Brasil, the mythical island supposed to be visible in the sunset from a wide range of places on the west coast of Ireland. *Ichabod!* Its charted position (in so far as it can be said to have had any accepted position on the charts) is now occupied by a shoal with the comparatively prosaic name of "Porcupine Bank."

St. Brandan's Isle, too, was long charted as the westernmost of the Azores; while Mayda, another mythical island which was probably a distorted version of Bermuda and was long a source of puzzlement to cartographers in general, turned up smilingly in the middle of the Bay of Biscay, on a map published at Chicago so recently as 1906.

Between these entirely mythical islands and the "doubtful" islands of the Admiralty charts, brief mention may be made of another class of island, apparently created for the sole purpose of irritating the map-maker, who may justly observe, with Fuseli the painter, that "Nature is always putting me in the wrong." These are the islands which appear and disappear, generally as the result of volcanic action; or which shift their position from time to time. Actual "floating islands" the cartographer severely and justly neglects. The best-known specimens, such as those in Lake Orion and the famous island in Derwentwater, can never form a menace to shipping, and may safely be left to the care of the Ordnance Survey and similar bodies; although it is worth noting that the Derwentwater island, which usually but not always comes up for a few weeks in summer (always in the same place) and then sinks again, was surveyed in 1887 by no less distinguished a cartographer than the late Admiral W. J. L. Wharton, then and for 17 years afterwards Hydrographer of the Navy.

At sea the mariner is almost as likely to fall in with a sea-serpent as with a floating island; practically the only hunting-ground for such phenomena is the Indian Ocean, where small islets formed of decayed vegetation and sometimes bearing small trees, are occasionally blown out to sea at the echanging of the monsoon. If we class some of the enormous Antarctic icebergs as islands, of course, the case is altered; and certainly, in dimensions some of them could give points to many real islands. For example, an L-shaped berg 60 by 40 miles in length was seen in the South Atlantic in 1865 and 1866, and one unfortunate vessel which got embayed between the two arms of the L was wrecked and destroyed on its shores quite as rapidly and efficiently as if she had blundered against Ushant in a fog. Even this is not a record (or, as *The Times* would print it, a "record") for size, for a Norwegian whaler recently sighted off the South Shetland Islands, an ice-island over a hundred miles long and obviously many miles in width.

But while floating islands are outside the purview of the cartographer, those irritating volcanic islands which periodically appear and disappear are not, and there have been many such cases. Falcon Island, in the northwest Pacific, is a good example of the class (it was "doing its stuff" quite recently) and there have been one or two instances nearer home.

For example, in the year 1831 an islet emitting smoke and fire appeared, like Venus Anadyomene, some miles off the southwest coast of Sicily and rose gradually to the height of over a hundred feet above sea-level with a diameter of about half a mile. At the end of the year, however, it found itself unable to support the honor of having been named "Graham Island," after Sir James Graham (Peel's "dirty boy"), then First Lord of the Admiralty. In consequence, it modestly effaced itself, sinking back towards the bed of the Mediterranean, and has ever since remained covered by several fathoms of water.